



FAA

Report AV2025002
October 9, 2024

FAA's Oversight Processes for Identifying and Resolving Boeing Production Issues Are Not Effective



Highlights

FAA's Oversight Processes for Identifying and Resolving Boeing Production Issues Are Not Effective

Requested by the Chairmen and Ranking Members of the House Transportation and Infrastructure Committee and its Subcommittee on Aviation and the Chair of the Senate Committee on Commerce, Science, and Transportation

Our Objective(s)

To evaluate FAA's oversight of Boeing 737 and 787 production, specifically its processes for (1) identifying and resolving production issues and (2) addressing allegations of undue pressure within the production environment.

Why This Audit?

Aviation safety is FAA's primary mission, and FAA's oversight of passenger aircraft in the United States includes ensuring that aircraft manufacturers meet requirements when producing new aircraft. However, since 2018, Boeing has experienced multiple manufacturing issues, in addition to complaints alleging ongoing production deficiencies and undue pressure on staff. In response to these concerns, the Chairmen and Ranking Members of the House Transportation and Infrastructure Committee and its Subcommittee on Aviation and the Chair of the Senate Committee on Commerce, Science, and Transportation requested this audit.

What We Found

Weaknesses in FAA's oversight processes and systems limit its ability to identify and resolve Boeing production issues.

- FAA's approach to overseeing Boeing manufacturing and production does not use data-driven assessments to target audits, and FAA has not structured its audits to perform comprehensive assessments.
- FAA has not adequately ensured that Boeing and its suppliers can produce parts that conform to the approved design. FAA does not require its inspectors to review First Article Inspections that are intended to ensure a manufacturer's processes can, at the outset, produce parts that meet engineering and design requirements.
- Further, FAA's compliance system cannot track milestones or determine whether potential repetitive noncompliances have occurred, nor has FAA assessed the effectiveness of Boeing's Safety Management System.
- Finally, FAA has not established criteria to return delegated authority to Boeing's Organization Designation Authorization (ODA).

FAA continues to face challenges addressing allegations of undue pressure within Boeing's aircraft manufacturing.

- FAA issued guidance for reporting allegations of interference to FAA. However, FAA has not enforced requirements that Boeing provide information in sufficient detail on alleged undue pressure allegations. Additionally, changes to FAA's review process have delayed FAA's ability to resolve allegations of undue pressure reported by Boeing.
- Further, despite FAA organizational changes to improve oversight, FAA managers did not know about the investigations of ongoing undue pressure allegations when they initiated a request to expand the authorized functions of Boeing's ODA.



16

Recommendations to improve FAA oversight of Boeing aircraft production. (p. 29)

Contents


Memorandum	1
Background	3
Weaknesses in FAA's Oversight Processes and Systems Limit Its Ability To Identify and Resolve Boeing Production Issues	6
FAA Continues To Face Challenges Addressing Allegations of Undue Pressure Within Boeing Aircraft Manufacturing	26
Conclusion	29
Recommendations	29
Agency Comments and OIG Response	31
Actions Required	31
Exhibit A. Scope and Methodology	32
Exhibit B. Organizations Visited or Contacted	34
Exhibit C. List of Acronyms	35
Exhibit D. Major Contributors to This Report	36
Appendix. Agency Comments	37



Memorandum

Date: October 9, 2024

Subject: ACTION: FAA's Oversight Processes for Identifying and Resolving Boeing Production Issues Are Not Effective | Report No. AV2025002

From: Nelda Z. Smith 
Assistant Inspector General for Aviation Audits

To: Federal Aviation Administrator

Aviation safety is the Federal Aviation Administration's (FAA) primary mission. FAA's oversight of passenger aircraft in the United States includes ensuring that aircraft manufacturers, such as The Boeing Company, meet requirements when producing new aircraft. This is an extraordinary responsibility considering more than 530 million passengers flew on Boeing aircraft in 2023. However, on January 5, 2024, the left mid-exit door plug blew out of Alaska Airlines Flight 1282 shortly after the flight departed Portland, OR. This accident involved a new Boeing 737-9 MAX delivered to Alaska Airlines just 2 months prior at the end of October 2023. This accident was the latest example of an aircraft manufacturing issue the company has faced. In the aftermath of the accident, Boeing's Chief Financial Officer acknowledged a longstanding problem, stating "that for years, we prioritized the movement of the airplane through the factory over getting it done right, and that's got to change." The accident brought renewed attention to FAA's oversight of the passenger aircraft production process, particularly at Boeing.

Since 2018, Boeing has experienced multiple manufacturing issues with the production of the Boeing 737 and 787 aircraft—the two production lines with the largest number of aircraft on order. Boeing paused its 787 aircraft delivery in 2020 due to production quality issues, and in December 2021, FAA mandated inspections on certain previously delivered 787 aircraft due to reports of missed requirements during assembly. FAA also temporarily grounded certain 737 MAX aircraft in January 2024 for additional inspections following the door-plug blowout. Further, Congress, FAA, and our office have received complaints alleging ongoing production deficiencies and undue pressure on Boeing staff in the 737 and 787 production lines.

In response to these manufacturing concerns, the Chairmen and Ranking Members of the House Transportation and Infrastructure Committee and its Subcommittee on Aviation and the Chair of the Senate Committee on Commerce, Science, and Transportation¹ requested that we evaluate FAA's oversight of Boeing aircraft production. Accordingly, our audit objectives were to evaluate FAA's oversight of Boeing 737 and 787 production, specifically its processes for (1) identifying and resolving production issues and (2) addressing allegations of undue pressure within the production environment.

We conducted this audit in accordance with generally accepted Government auditing standards. Exhibit A details our scope and methodology. Exhibit B lists the organizations we visited or contacted, and exhibit C lists the acronyms used in this report.

We appreciate the courtesies and cooperation of Department of Transportation (DOT) representatives during this audit. If you have any questions concerning this report, please contact me or Tina Nysted, Program Director.

cc: The Secretary
DOT Audit Liaison, M-1
FAA Audit Liaison, AAE-100

¹ On November 18, 2021, Chair Peter DeFazio and Ranking Member Sam Graves of the House Committee on Transportation and Infrastructure and Chair Rick Larsen and Ranking Member Garret Graves of the Subcommittee on Aviation requested this audit. On May 23, 2022, Chair Maria Cantwell of the Senate Committee on Commerce, Science, and Transportation also requested this audit.

Background

Regulatory Requirements

FAA requires that each production approval holder (PAH) (e.g., aircraft manufacturer) establish a quality system addressing 15 elements to ensure that products conform to the PAH's approved design and are in a condition for safe operation.² These elements include items such as document, tool, and supplier controls. According to policy in FAA Order 8120.23A, the certificate management program is how "FAA fulfills its statutory responsibilities to ensure a PAH remains in compliance with those regulations that govern the manufacturing of its products or articles. It is a system approach to monitoring a PAH's compliance with regulations that ensures appropriate corrective actions are taken." This Order provides policy and guidance for FAA inspectors overseeing manufacturers and establishes auditing as an integral oversight function. The Order provides guidance to FAA, specifically employees who participate in certificate management activities conducted at a PAH, such as Boeing, or its suppliers. Certificate management activities include planning, conducting, and documenting audits³ and ensuring the PAH takes corrective actions in the event of a noncompliance.

During the annual audit planning phase, FAA policy requires inspectors to assess the risk level of each PAH. Inspectors determine the overall exposure in the National Airspace System based on items such as number of aircraft produced, number of aircraft models, and the percentage of critical parts provided by suppliers. Then, inspectors focus on organizational risk at the PAH based on the potential to produce nonconforming parts. After making those determinations, inspectors must select the point of manufacturing facilities to conduct audits.

FAA policy specifies two types of product-based audits that inspectors perform. One type of audit is narrowly focused on a specific part, assembly, or process and should be conducted where those processes are performed, whether at the PAH or a supplier. FAA performs principal inspections at PAH facilities and uses supplier control audits at PAH supplier facilities. All audits, regardless of location performed, are focused on ensuring the effectiveness of the PAH quality system and ensuring products conform to approved design requirements.

The second type of audit is a quality system audit (QSA). A QSA is designed to evaluate whether a PAH meets and complies with Federal requirements and

² 14 Code of Federal Regulations (C.F.R.) § 21.137.

³ FAA inspectors perform product-based audits to determine whether (1) products and articles conform to approved data, (2) production approval holders comply with quality system requirements, and (3) suppliers furnish products, articles, or services that conform to the production approval holder's requirements.

procedures from a broader perspective. FAA inspectors document all audit results, including any findings of noncompliance, in FAA’s Aircraft Certification Audit Information System (ACAIS). Figure 1 shows the minimum number of required audits based on the PAH’s risk assessment.

Figure 1. Minimum Audits Required Based on FAA’s PAH Risk Determination

Level 3 Low	Level 3 Medium	Level 2 Low	Level 2 Medium	Level 2 High	Level 1 Low	Level 1 Medium	Level 1 High
1+ Audit within every 60 months	1+ Audit within every 48 months	1+ Audits within every 36 months 1 QSA NTE 48 months	3+ Audits within every 24 months 1 QSA NTE 36 months	4+ Audits within every 12 months 1 QSA NTE 24 months	6+ Audits within every 12 months 1 QSA NTE 36 months	12+ Audits within every 12 months 1 QSA NTE 24 months	18+ Audits within every 12 months 1 QSA NTE 24 months

Source: FAA Order 8120.23A

Note: NTE means not to exceed.

FAA’s Compliance and Enforcement Program policy, Order 2150.3C, establishes requirements for ensuring the PAH implements corrective actions to resolve the noncompliance and prevent recurrence. One program aspect involves promoting safety and compliance by encouraging manufacturers to voluntarily disclose violations to FAA through the Voluntary Disclosure Reporting Program. When a PAH identifies a regulatory noncompliance and promptly discloses the information, FAA will forego potential civil penalties if the PAH meets the requirements of the program. Under those requirements, a violation must have been inadvertent, and the PAH must take expedient action to stop the conduct that resulted in the noncompliance and develop a comprehensive fix to prevent recurrence.⁴ FAA inspectors use the Agency’s Compliance and Enforcement Action (CEA) system to manage the voluntary disclosure and document corrective actions taken by the PAH to enhance safety.

A second program aspect focuses on the responsibility of FAA inspectors to ensure that statutory or regulatory noncompliances are addressed promptly through the FAA Compliance Program—including the use of a compliance,

⁴ FAA Advisory Circular 00-68, *Aircraft Certification Service Voluntary Disclosure Reporting Program*, October 1, 2016.

administrative, or legal enforcement action—when inspectors identify noncompliances. Once an inspector completes an audit and documents the results in ACAIS, the inspector must then separately enter any noncompliances into the CEA system. Inspectors use the CEA system to manage noncompliances until the PAH implements corrective actions and verifies the effectiveness of those actions.

In addition to the regulatory requirements for manufacturers, Boeing, in a 2015 settlement agreement with FAA, committed to implementing a Safety Management System (SMS). Under an SMS, organizations identify and analyze potential hazards and mitigate risk to an acceptable level. An SMS is a proactive approach to identify and control potential safety risks rather than a reactive approach focusing on discovering and mitigating the cause of an accident or safety issue after it has occurred. On April 26, 2024, FAA published the SMS final rule that became effective on May 28, 2024. Current PAHs, like Boeing, have until November 28, 2024, to submit their implementation plan for FAA’s review and then until May 28, 2027, to implement it.

Organization Designation Authorization

FAA implemented the Organization Designation Authorization (ODA) program⁵ in 2009 to standardize its oversight of organizations, such as aircraft manufacturers, and to ease FAA’s workload. The Boeing ODA is comprised of Boeing employees who are authorized to perform tasks delegated by FAA. For Boeing, FAA has delegated tasks such as performing inspections and issuing airworthiness certificates⁶ and engineering determinations for parts that do not meet type design.

FAA Order 8100.15B establishes the procedures and guidance for inspectors authorizing and overseeing ODAs. Within an ODA, employees who perform functions on behalf of FAA are called unit members. ODA holders, such as Boeing, must ensure that unit members are free to perform their duties. FAA evaluates whether unit members are “in a position that provides enough authority and time to perform duties without pressure or influence from other parts of the organization.”

To supplement its oversight policy, FAA published Notice N 8100.17 on September 7, 2022, to address ODA holder interference with unit members. FAA included this update in response to the Aircraft Certification, Safety, and

⁵ FAA grants organizations and companies the authority to perform specific functions on behalf of FAA. Organization Designation Authorization, C.F.R. Part 183, Subpart D.

⁶ FAA retained authority to issue standard and export airworthiness certificates for all 737 MAX airplanes on November 26, 2019, and all 787 airplanes on February 15, 2022.

Accountability Act.⁷ Then, in September 2023, FAA updated the notice with new procedures and instructions to limit or eliminate interference of unit members' authorized duties and encourage open communication between unit members and FAA.

Weaknesses in FAA's Oversight Processes and Systems Limit Its Ability To Identify and Resolve Boeing Production Issues

Although FAA has exceeded the minimum number of audits it requires itself to complete to oversee Boeing production and manufacturing, the Agency's current audit processes are not comprehensive enough to adequately identify key discrepancies and noncompliances within the Boeing production line. FAA also has not addressed longstanding weaknesses in Boeing's oversight of suppliers. When discrepancies or noncompliances are found, FAA's CEA system⁸ is not effective for tracking milestones or determining if identified issues are repetitive and thus require elevated FAA action. Further, FAA has not fully assessed Boeing's SMS, an assessment that could provide beneficial information to enhance FAA oversight of new SMS requirements for aircraft manufacturers.⁹ Finally, FAA has not established criteria regarding whether it will return delegation authority to Boeing.

FAA Does Not Have an Effective System To Oversee Individual Boeing Manufacturing Facilities

FAA's oversight approach has not successfully resolved longstanding Boeing production issues. FAA does not use data-driven risk assessments to target its audits, and it has not structured its audits to perform comprehensive assessments. FAA guidance states that FAA should perform at least 18 audits of Boeing facilities—including supplier facilities—every 12 months, with more in-depth quality system audits every 24 months. FAA performed more than 300 audits over a 3-year period, far exceeding its audit requirements. While FAA

⁷ Aircraft Certification, Safety, and Accountability Act, Public Law Number (Pub. L. No.) 116-260, Div. V (2020) (codified at 49 U.S. Code (U.S.C.) § 44742).

⁸ The CEA system is a software application used by FAA Aircraft Certification Services personnel to streamline the process of entering and managing noncompliant issues.

⁹ See FAA Safety Management Systems: Final Rule, 89 Federal Register 33068 (Apr. 26, 2024).

oversees 15 specific elements of Boeing’s quality system, more than 45 percent of inspector findings related to just 2 elements—manufacturing process control or inspection and testing. Still, longstanding Boeing production issues persist.

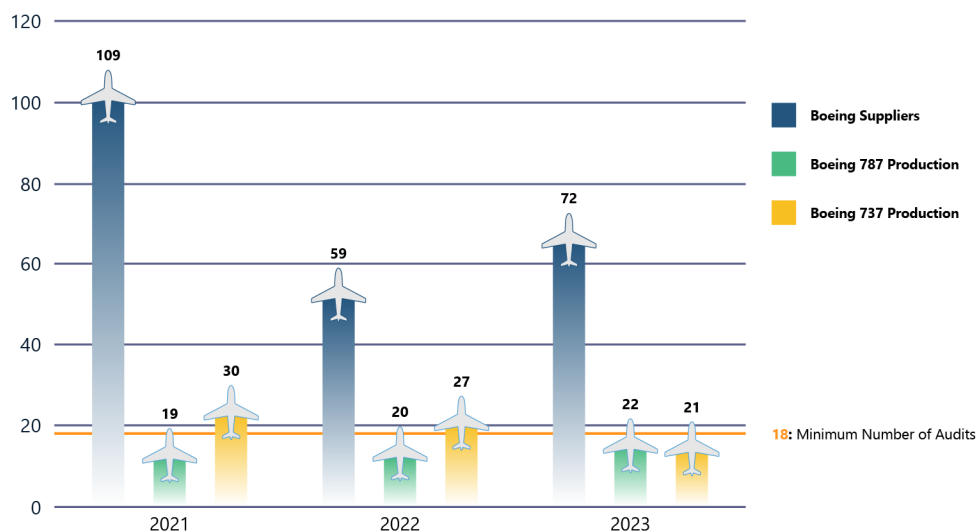
FAA’s Risk-Based Approach Is Limited by Its Inability To Assess Risk Within the Manufacturing Environment

FAA does not have sufficient information to determine risk within Boeing manufacturing facilities. FAA policy¹⁰ requires inspectors to determine risk levels for manufacturers, which establish the minimum number of audits inspectors must perform of each manufacturer annually. However, given the scope of Boeing operations, in 2014, FAA began conducting risk assessments at individual Boeing facilities rather than treating Boeing as a single entity. FAA currently assesses risk for 22 Boeing facilities. FAA determined that multiple Boeing facilities, such as the Renton, WA, and Charleston, SC, facilities that produce the 737 and 787, respectively, were high risk. While FAA updates risk assessments annually, it consistently considers these facilities high risk due to the complexity of Boeing’s quality system, level of outsourcing, organizational stability, relationship with FAA, and overall compliance history. However, without assessing the risk within each facility, FAA cannot effectively target inspector resources.

FAA policy establishes the minimum number of audits required based on risk assessments. However, the policy is inadequate for a manufacturer as large and complex as Boeing. For example, the policy only requires 18 audits every 12 months, with more in-depth quality system audits every 24 months, for all of Boeing and its suppliers combined. For Boeing, FAA uses its individual site risk assessments to increase the minimum number of audits required based on the risk determination for each facility and at suppliers. As shown in figure 2, in fiscal years 2021–2023, FAA completed more than the required minimum number of audits at Boeing suppliers and 737 and 787 production facilities.

¹⁰ FAA Order 8120.23A, *Certificate Management of Production Approval Holders*, March 6, 2017.

Figure 2. Number of FAA Audits Completed at Boeing Suppliers and 737 and 787 Production Facilities, Fiscal Years 2021–2023



Source: Office of Inspector General (OIG) analysis of FAA data

While the total number of audits conducted during this 3-year period far exceeds the 54 audits required during that period, production issues at Boeing and its suppliers persist. These issues raise questions as to whether FAA’s audits can validate that Boeing effectively complies with Federal regulations, FAA-approved type designs, and Boeing’s quality system requirements. This is occurring, in part, because FAA inspectors do not have guidance on how to assess risk within manufacturing facilities to aid in audit planning to effectively target audit work. For example, Boeing maintains data that FAA could use to identify which areas, operators, or shifts have completed items requiring rework or replacement at its 787 final assembly facility. When FAA inspectors assessed that facility to assign risk levels to each area, they did not request or review this data from Boeing, and there was no FAA requirement to do so. As such, FAA missed an opportunity to better target its oversight by incorporating pertinent manufacturing data to identify potential areas with increased risk.

Given the number of audits performed each year relative to the number of manufacturing processes—more than 2,400 for the 737 and 4,400 for the 787 just for final assembly—FAA must have accurate risk determinations when planning audits to ensure inspectors audit the areas of highest risk within Boeing and its supply chains. By relying on incomplete data, FAA cannot be assured it has evaluated all areas to identify potential risk or that existing determinations are accurate within each Boeing facility, thereby limiting FAA’s ability to perform risk-based oversight in the manufacturing environment.

FAA Does Not Use a Comprehensive Audit Process

To oversee manufacturing, FAA managers assign audit work, but inspectors can decide what to audit based on their individual experience and what activities are occurring on the production floor during the time of the audit. This ad-hoc approach to auditing exists because FAA lacks a structured process to provide a comprehensive assessment of Boeing production over time. According to one senior FAA official, FAA inspectors, when hired, often have a narrow scope of experience, which results in those inspectors choosing to audit areas or processes in which they have experience. Further, inspectors do not typically perform unscheduled audits or review processes performed outside of first shift Monday through Friday. Because FAA does not frequently perform audits outside of first-shift hours, inspectors cannot review certain tasks, such as aircraft pressurization and aircraft movement, on the production floor that Boeing performs on shifts when fewer workers are present.

According to FAA inspectors, Boeing can also change task schedules without notice. So, while the audit would still take place, the inspector can only review what is occurring onsite during the time of the audit. There are more than 6,800 final assembly processes combined, some of which only occur outside of first-shift hours, to oversee the 737 and 787 aircraft models, so a change in the schedule further limits FAA's ability to oversee the tasks that occur outside of first-shift hours. Without addressing these items to promote a comprehensive approach to review Boeing manufacturing, FAA may not know about manufacturing issues or may miss an opportunity to identify areas of significant risk.

The comprehensiveness of FAA's oversight is further limited by challenges FAA inspectors face in identifying manufacturing processes the Agency has previously audited. More specifically, ACAIS does not have a mechanism to track information about processes unless an inspector identifies a noncompliance. Inspectors said that, instead, they use a spreadsheet to help manage audits. However, the spreadsheet provided for our review only tracks noncompliances and does not include a comprehensive list of manufacturing processes that inspectors have audited. Without knowing what processes or areas inspectors have reviewed, FAA cannot determine noncompliance rates or appropriately target resources to audit processes that have not been audited.

FAA Does Not Have Clear Guidance To Accurately Identify Systemic Noncompliances

Inspectors generally classify noncompliances as isolated, even when similar issues were previously identified, and may not be accurately identifying systemic noncompliances. FAA guidance requires inspectors to document noncompliances and defines both systemic and isolated noncompliances. The guidance, however,

is vague, circular, and open to inspector subjectivity, as illustrated in figure 3 below.

Figure 3. FAA Definitions of Systemic and Isolated Noncompliances

- | |
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| <p>(1) Systemic: a noncompliance to 14 CFR, FAA-approved data, the facility's internal procedures, or purchase order requirements that is systemic in nature; (i.e., is pervasive, repeatable, and represents a breakdown in the quality system).</p> <p>(2) Isolated: a noncompliance to 14 CFR, FAA-approved data, the facility's internal procedures, or purchase order requirements that is isolated or nonsystemic in nature; (i.e., is not pervasive or repeatable, and does not represent a breakdown in the quality system).</p> |
|--|

Source: FAA Order 8120.23A

The guidance does not provide criteria or parameters that establish how often a noncompliance must occur to be considered pervasive or repeatable, nor does it explain what would represent a breakdown in the quality system. Inspectors document noncompliances and assign a standardized code that identifies the type of issue. Inspectors must also determine whether the noncompliance is isolated or systemic and then document their determination.

We found that FAA inspectors classified multiple noncompliances that were similar in nature as isolated, even when the noncompliances were identified in the same audit. For example, in February 2023, an FAA inspector identified five noncompliances for handling and storage control and classified all of them as isolated. Boeing took immediate corrective actions to address the findings, but because the inspector identified the noncompliances as isolated and not systemic, FAA did not require Boeing to determine root causes to identify what led to the noncompliances. We also found that inspectors identified 107 noncompliances related to inspection and testing at the 737 production facility from fiscal years 2021 through 2023. Of those 107 noncompliances, FAA inspectors classified only 3 as systemic. Notably, FAA inspectors classified an issue that involved deficiencies with work instructions as an isolated noncompliance, even though Boeing used the same work instructions on each aircraft produced. Without a clear, consistent approach to classifying noncompliances as either isolated or systemic, FAA cannot assure that Boeing properly identifies root causes and implements corrective actions necessary to address the noncompliances.

FAA Has Not Ensured Boeing Effectively Resolved Its Supplier Issues, Despite Long-Known Risks

FAA has not adequately ensured that Boeing and its suppliers can produce parts that conform to the approved design. Compliance with these requirements is critical because there are thousands of companies involved in manufacturing Boeing aircraft. While Boeing is ultimately responsible for ensuring its aircraft conform to the FAA-approved design, Boeing identified its suppliers as a source for multiple manufacturing issues with its 737 and 787 aircraft. Figure 4 below shows five examples.

Figure 4. Sources of 737 and 787 Manufacturing Issues

FLEET	DATE	ORIGIN	PART
787	OCT/NOV 2020	Primary Suppliers	Fuselage Sections
	JUL 2021	Primary Supplier	Fuselage Sections
737	APR 2023	Primary Supplier	Vertical Fin
	AUG 2023	Primary Supplier	Aft Pressure Bulkhead (APB)
	JAN 2024	TBD (Ongoing NTSB Investigation)	Door Plug Panel

Source: OIG analysis of FAA data

Note: NTSB is the National Transportation Safety Board.

FAA has known about weaknesses in manufacturers' oversight of suppliers since at least 2008. In a 2008 Office of Inspector General (OIG) audit report,¹¹ we stated,

Although manufacturers are ultimately responsible for the quality of parts used on their aircraft, three of the five manufacturers we reviewed did not have procedures in place to routinely visit all their

¹¹ *Assessment of FAA's Risk-Based System for Overseeing Aircraft Manufacturers' Suppliers* (OIG Report No. AV-2008-026), February 26, 2008. OIG reports are available on our website at <http://www.oig.dot.gov>.

critical suppliers and subtier suppliers. Consequently, neither manufacturers nor FAA inspectors have provided effective oversight of suppliers; this has allowed substandard parts to enter the aviation supply chain.

A 2014 joint FAA and Boeing task force also identified weaknesses in FAA's and Boeing's oversight of suppliers. As evidenced in figure 3, Boeing suppliers remain a source of multiple manufacturing issues. Boeing continues to rely on a vast network of suppliers to produce and assemble aircraft components ranging from simple fasteners to entire flight deck sections, for which oversight is essential.

FAA Limits Its Oversight of Boeing Suppliers to Primary Suppliers

FAA's focus on primary suppliers limits the Agency's view of overall parts manufacturing and its ability to assess risk within the supply chain. FAA guidance requires inspectors to conduct audits to determine whether Boeing is effectively controlling its suppliers. While FAA guidance states that "[m]anufacturing locations to be audited should be prioritized based on the risk assessment results," inspectors do not have to assess the risk of suppliers or their subtier suppliers. Additionally, the guidance does not require FAA to account for the total number of Boeing suppliers (including subtier suppliers); what each supplier manufactures; or the number of audits needed to oversee suppliers, which FAA needs to conduct risk assessments and effectively target resources. As a result, we found that inspectors did not know which primary and subtier suppliers Boeing used to manufacture parts—echoing findings from our 2008 report that FAA did not maintain a list of suppliers. Without this information, FAA cannot establish an effective risk-based oversight system.

Even though FAA does not require inspectors to perform risk assessments of Boeing suppliers, a senior FAA inspector developed a spreadsheet listing more than 700 Boeing primary suppliers. The inspector used 15 data points about each supplier and its relationship to Boeing to prioritize suppliers for audits. The spreadsheet is a significant first step in obtaining critical supplier data. However, it is incomplete because it does not contain Boeing's subtier suppliers. Without an all-inclusive list of suppliers, FAA cannot implement a true risk-based approach to oversee Boeing.

FAA and Boeing came to a similar conclusion in their 2014 joint review. The joint review team reported¹² that Boeing's business model presented challenges for manufacturing and quality and "observed that FAA certificate management policy does not align with current [787] supply chain environment, nor will it adequately accommodate future aircraft manufacturing surveillance using alternative

¹² Boeing 787-8 Design, Certification, and Manufacturing Systems Review, March 19, 2014.

business models (such as Boeing’s business model).” Specifically, the review team reported that the FAA Orders do not “encourage surveillance at critical subtier suppliers and require risk management models to allow assigning risk and surveillance requirements at integrator tier suppliers.” The review team recommended that FAA address these observations, but FAA does not have a policy requiring it to formally address weaknesses uncovered in these types of reviews and has yet to resolve these issues.

In our 2008 report, we also noted that subtier suppliers were operating with limited oversight from both FAA and manufacturers. The 2014 joint review team echoed these concerns when it traced manufacturing issues and parts failures to “inadequate verification and/or validation of established Boeing design requirements.” Under existing processes, Boeing uses contracts and purchase order notes to communicate quality system requirements to its suppliers. Boeing then expects primary suppliers to communicate quality system requirements to subtier suppliers. However, in at least two cases we identified, suppliers rejected Boeing requirements and continued producing parts without following Boeing’s processes. FAA audits also identified discrepancies with supplier-manufactured parts, including inadequate inspections, failure to follow sampling plans, and failure to communicate requirements to subtier suppliers. Despite knowing about these weaknesses since at least 2008, FAA has not updated its guidance to require inspectors to assess risk at various supplier levels.

FAA Does Not Require Inspectors To Review First Article Inspections To Verify That Boeing and Suppliers’ Production Processes Are Capable of Producing Fuselage Sections That Meet Design Requirements

FAA cannot determine when or if its inspectors are reviewing key inspections required by Boeing’s FAA-approved quality system. Boeing requires its suppliers to perform First Article Inspections (FAIs) in accordance with industry standards to show that the supplier’s production system can produce conforming parts. However, Boeing has not consistently reviewed FAIs to ensure they were performed as required or that the results were satisfactory. Further, FAA does not require its inspectors to review FAIs nor does it have an effective method of tracking FAI reviews that inspectors have conducted. As a result, FAA and Boeing have no assurance that Boeing’s suppliers’ processes can produce parts that meet design requirements.

The primary purpose of an FAI is to ensure a manufacturer’s processes can, at the outset, produce parts that meet engineering and design requirements. The producer (either Boeing or the supplier) should perform these inspections on parts from the first production run and then repeat an inspection when certain changes occur—such as a new design, a changed design, a change in facility, manufacturing equipment move, or a change in company producing the item.

The producer then documents the results of the FAI in an FAI report. If all inspected characteristics conform to the design requirements, the FAI is considered "complete." If a part does not conform to all inspected requirements, the FAI is considered "not complete." The producer must then implement corrective actions and perform another FAI to verify the improved processes produce conforming parts. If the follow-up FAI also identifies nonconforming characteristics, the producer must implement additional corrective actions and perform another FAI. The producer must repeat this process until an FAI verifies the manufacturing processes can produce a part that meets all design requirements. When properly performed, the FAI process can provide numerous benefits to the manufacturer, including reduced risk, lower costs, and fewer production delays.

Boeing, however, experienced numerous delays and increased costs associated with fuselage sections of its 787 aircraft that had missing or unsuccessful FAIs. Yet, neither FAA nor Boeing have taken action to resolve the missing or failed FAIs on the 787 fuselage sections. Instead, Boeing has focused on rework to correct previously assembled aircraft and changes to manufacturing processes—without performing FAIs to ensure the revised processes can produce parts and assemblies that meet design requirements. Put another way, Boeing addressed the issue on individual aircraft instead of verifying that changes to the production processes could produce conforming parts.

Further, despite FAA managers acknowledging it "is just good auditing" to review FAI records as part of an audit, FAA does not require its inspectors to review FAIs to verify whether Boeing has sufficient supplier and manufacturing controls to ensure the manufacturing processes can produce products that conform to the approved design. Moreover, according to FAA's Principal Inspector for Boeing, FAA managers cannot determine whether inspectors have reviewed FAIs because they are not tracked in the audit system. As a result, FAA did not know that Boeing and three of the four suppliers of fuselage sections did not have "complete" FAIs verifying that their manufacturing processes could produce parts that adhered to design requirements.

Boeing uses four external suppliers and one internal facility to produce sections of the 787 fuselage, as shown in figure 5 below.

Figure 5. Boeing Suppliers Used To Produce 787 Fuselage Sections



Source: Boeing, modified by OIG

FAA issued the type certificate for the 787 in 2011 and then issued the first certificate of airworthiness on September 23, 2011, allowing Boeing to deliver the first 787 aircraft to an air carrier 3 days later. However, Boeing could only provide documentation showing a “complete” FAI for one section of the 787 fuselage when deliveries began. Less than 3 years later, FAA and Boeing identified excessive gaps between structural elements as part of its joint review of the 787.¹³ According to the lead FAA representative for the review team, Boeing was correcting the issue before delivering aircraft, so, at the time, the review team did not consider the gaps a significant issue. However, in 2019, Boeing began identifying unacceptably large gaps between the two fuselage sections it produced.

When two fuselage sections are joined together at a Boeing final assembly facility, production workers must measure the gap around the circumference of the fuselage where the two sections meet. Any gap that exceeds engineering specifications is filled with a shim. Boeing engineers determined any gap exceeding .005” across a 5” span of the end of the fuselage section where two

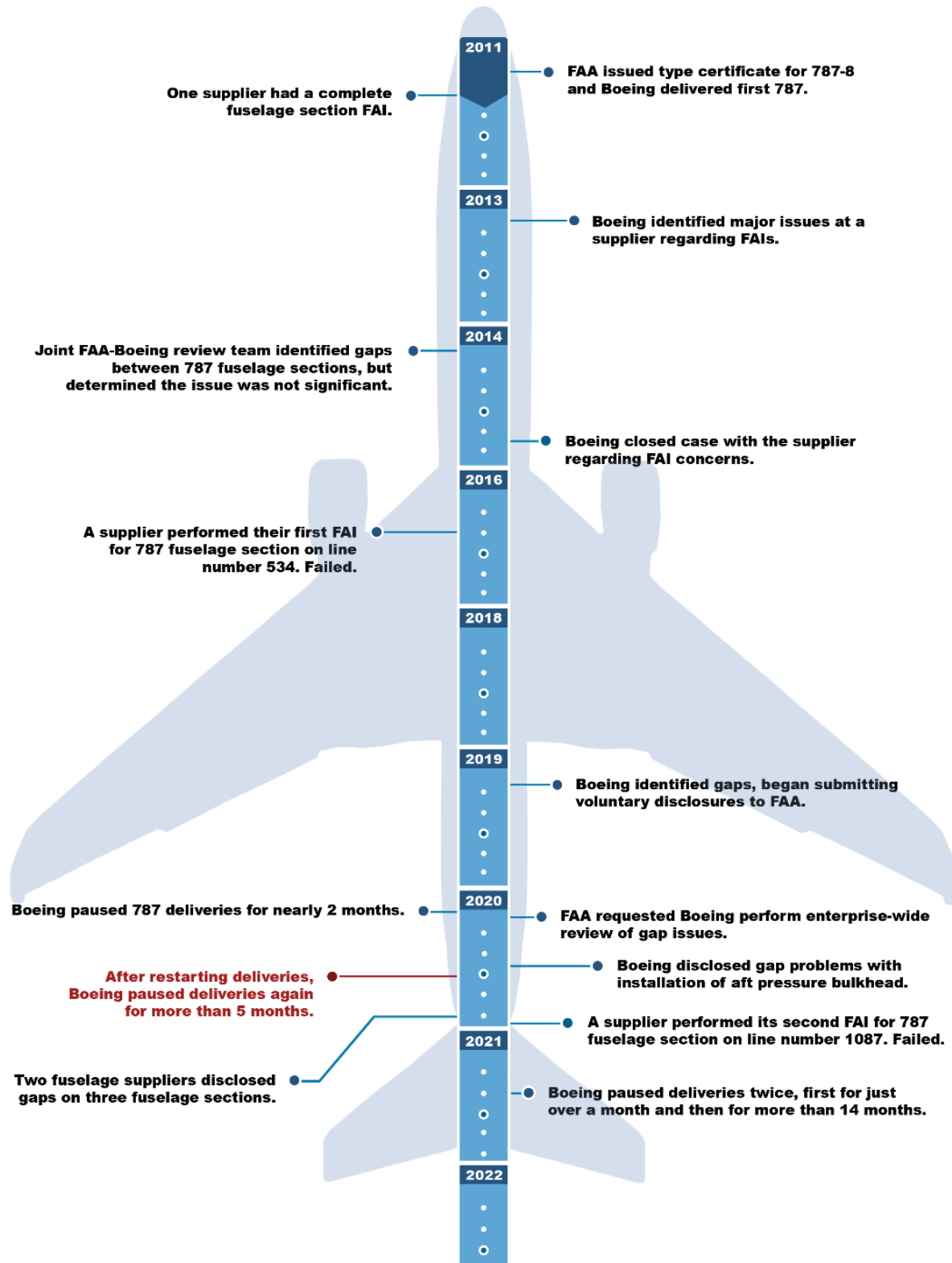
¹³ Boeing 787–8 Design, Certification, and Manufacturing Systems Review, March 19, 2014.

sections were joined, must be filled with a shim. This engineering standard was known as ".005"/5"" or "5 X 5."¹⁴

FAA, on June 5, 2020, requested that Boeing evaluate the shimming process to identify and resolve shimming-related manufacturing errors, including at least four unsafe conditions. Boeing initiated the evaluation to uncover the root causes of the deficiencies, identify problem areas where major airframe components are joined (e.g., body sections and wing to body), and review other Boeing models in production to determine if those models also experience similar, recurring manufacturing nonconformances. As part of this effort, Boeing paused deliveries of 787 aircraft in 2020 to address the issues. The first pause lasted approximately 2 months, but the extent of the issues ultimately resulted in delays totaling nearly 2 years. Figure 6 highlights key events regarding delivery pauses and fuselage FAls.

¹⁴ Boeing's Director of Quality told us .005" is approximately the size of two pieces of printer paper, one on top of the other. In other words, while these gaps are unacceptably large in terms of engineering specifications, they are small in absolute terms.

Figure 6. Key Events for 787 Manufacturing Issues and Delays

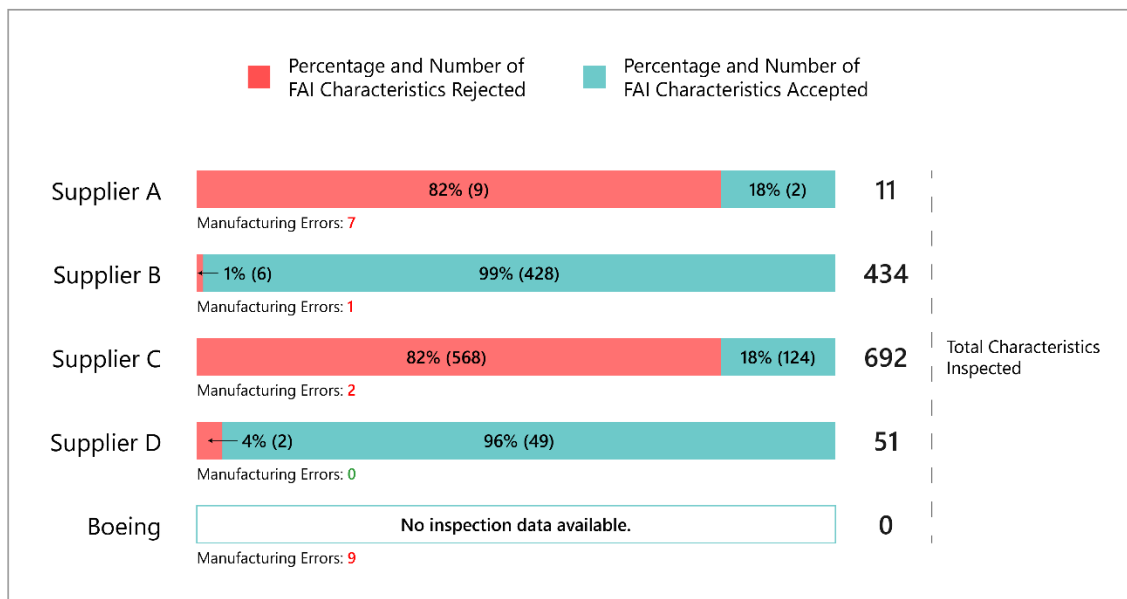


Source: OIG analysis of FAA and Boeing documentation

Boeing also requested that each supplier of major fuselage sections conduct its own inspection of the fuselage end surfaces where sections were joined. Between August 2019 and July 2023, Boeing and its partner suppliers of large fuselage structural components filed 37 voluntary disclosure reports with FAA for unacceptably large gaps between fuselage sections and other manufacturing nonconformances. Only one of four external suppliers had evidence of "complete" FAIs for the fuselage sections. Further, Boeing could not provide evidence that it had performed FAIs for the sections manufactured in Boeing facilities. According to Boeing representatives, the inspections may have occurred, but they could not locate or provide any records to that effect. When we raised these concerns with FAA, the FAA manager overseeing 787 production said they did not know that Boeing had used fuselage sections without "complete" FAIs. Despite Boeing's and FAA's multiyear effort to address numerous gap and shimming issues with fuselage sections, and the lack of a fuselage FAI identified by the FAA manager, neither FAA nor Boeing realized only one of seven fuselage sections had a "complete" FAI.

When compared to the manufacturing errors reported by Boeing, we found the fuselage section with the "complete" FAI was the only section without reported manufacturing errors. The remaining sections had failed or missing FAIs with no evidence that Boeing or the supplier had performed a follow-up inspection to verify it could produce a conforming part. For example, one supplier had performed two FAIs with approximately 56 percent of the characteristics failing on one and 99 percent failing on the other. Figure 7 summarizes the number of characteristics inspected on each section, how many of those characteristics were rejected, and the number of reported manufacturing errors for the associated sections.

Figure 7. FAI Results and Associated Manufacturing Errors for 787 Fuselage Section Suppliers



Source: OIG analysis of Boeing and supplier data

The manufacturing errors occurred, in part, because Boeing and FAA did not verify that either Boeing or its suppliers had “complete” FAIs or that the parts were produced in accordance with design requirements. For example, Boeing identified major concerns with a supplier’s adherence to FAI requirements in 2013 that affected 737, 767, and 787 aircraft but were unrelated to the 787 fuselage sections. Boeing accepted the supplier’s changes and considered the issue closed in December 2014. Nearly 2 years later, the supplier performed its first FAI on a 787 fuselage section—on the 534th section it manufactured. The supplier performed three FAIs for 787 fuselage sections between November 2016 and November 2022, but none were “complete.”

The purpose of FAIs is to verify that manufacturing processes can produce parts that meet design requirements. However, FAA’s lack of a requirement for inspectors to review FAIs, and its inability to determine whether inspectors have done so, limit its effectiveness at ensuring that Boeing’s and its suppliers’ manufacturing processes can produce parts that meet design requirements. Further, nonconforming parts from Boeing’s primary and subtier suppliers have negatively impacted the production, delivery, and operation of 787 aircraft, resulting in economic impacts exceeding \$5.8 billion in losses due to required rework.

FAA's Compliance and Enforcement Action System Lacks Key Features To Identify Repetitive Issues and Manage Cases

FAA's CEA system lacks key features that inspectors could use to ensure Boeing identifies root causes and implements effective corrective actions for noncompliances. FAA inspectors use the CEA system to create and maintain records associated with noncompliances they identify or that Boeing voluntarily discloses. However, FAA inspectors cannot use the system to track milestones or determine whether noncompliances are repetitive, which would require the inspector to address the noncompliance with elevated enforcement actions. These limitations exist, in part, because when FAA created the system, it did not fully establish the functionality inspectors would need to manage noncompliances or ensure the system capabilities aligned with FAA policy requirements. As a result, FAA inspectors continue to face challenges managing cases and identifying potential trends in noncompliances.

According to FAA's Compliance Program, "FAA's goal is to use the most effective means to ensure an individual or entity returns to full compliance and prevent reoccurrence." For manufacturing oversight, FAA primarily uses compliance actions when its inspectors identify a noncompliance. In contrast, for issues identified by Boeing, FAA encourages the manufacturer to voluntarily disclose the issues to FAA to forgo potential enforcement actions if Boeing meets certain requirements, including promptly reporting the noncompliance, stopping the actions that led to the noncompliance, and developing and implementing corrective actions to prevent recurrence. As shown in figure 8 below, FAA initiated approximately 37 percent of the nearly 1,100 cases pertaining to Boeing noncompliances in fiscal years 2021 through 2023. Boeing voluntarily disclosed approximately 63 percent of cases in the same timeframe.

Figure 8. Percentage of Noncompliance Cases Voluntarily Disclosed by Boeing, Fiscal Years 2021–2023



Source: OIG analysis of FAA data

The CEA system does not allow inspectors to effectively track or manage Boeing action dates. When documenting case information in the system, FAA inspectors input a noncompliance summary, Boeing’s root cause determination and corrective action plan with estimated completion dates, and the results of Boeing’s verification. However, much of this information is documented in files instead of using data fields. Boeing also submits letters to FAA requesting additional time to complete root cause determinations or corrective actions. Inspectors upload the extension letters to the CEA system but do not have a way to notate in the system Boeing’s next required action date or the number of extensions FAA has granted. As a result, inspectors cannot effectively track dates for Boeing’s required actions using the CEA system. Much like the audit process, inspectors rely on offline spreadsheets or reminders on their calendars to monitor the deadlines.

Furthermore, the CEA system does not allow inspectors to easily identify repeat noncompliances. FAA guidance¹⁵ requires inspectors to initiate administrative or legal enforcement action for repeat noncompliances. The guidance instructs inspectors to use due diligence when determining a repeat noncompliance by considering the similarity of the regulation, the location or system, the cause, and the corrective action taken for previous noncompliances. FAA’s system allows inspectors to document each of these items, but it does not have a mechanism for inspectors to easily identify previous noncompliances with similar

¹⁵ AIR-002-035, *Aircraft Certification Service (AIR) Compliance and Enforcement Process*, October 1, 2016.

characteristics. Instead, inspectors rely on their knowledge of previous noncompliances when determining repeat issues.

The inability to easily identify repeat noncompliances and root causes also limits FAA's ability to ensure that Boeing's corrective actions have addressed the underlying deficiency. For example, FAA identified multiple issues with tool control and foreign object debris. While FAA evaluates Boeing's quality system and its ability to produce conforming parts and follow its procedures, inspectors did not consider similar issues as repetitive and allowed Boeing to focus corrective actions on individual noncompliances instead of taking a more holistic approach to determining root causes and implementing appropriate corrective actions. As a result, FAA and Boeing continue to identify issues with tool control and foreign object debris.

Relatedly, we found that FAA accepted identical root causes for similar items, including some that seemed incomplete or poorly articulated. For example, in one compliance action Boeing reported a root cause of "[p]rogram mindset institutionalized inertia in the inherited legacy build process mindset" for repeat noncompliances at a supplier. FAA accepted this root cause on at least three occasions. Accepting the supplier's institutional mindset as the root cause should have raised questions for both FAA and Boeing about the culture of the supplier's organization. However, FAA accepted corrective actions targeting inspection processes rather than ensuring that Boeing addressed the culture issues identified. In these cases, FAA inspectors accepted Boeing determinations based on their judgment without engaging with other inspectors or management to evaluate Boeing's root causes.

FAA has since implemented weekly meetings with management to evaluate and discuss Boeing's root cause determinations before accepting or rejecting them. However, FAA has not formalized this process to ensure inspectors adequately assess Boeing's root causes and associated corrective actions. When FAA accepts root cause determinations that are insufficient or incorrect, the corrective actions are less likely to resolve the problem.

Given FAA's limited oversight relative to the scope of Boeing operations, the ability to identify trends within FAA's CEA system for noncompliances and associated root causes provided is essential for FAA to identify systemic issues and propose appropriate corrective actions.

FAA Has Not Assessed the Effectiveness of Boeing's SMS

FAA has not reviewed Boeing's SMS to ensure noncompliances addressed under Boeing's quality system also flow through Boeing's SMS. While FAA recently

issued a final rule requiring aircraft manufacturers to implement an SMS, Boeing earlier committed to developing one as part of a 2015 settlement agreement with FAA. That agreement required Boeing to implement an SMS and establish processes aligning with the SMS plan to “apply lessons learned from regulatory noncompliances in a manner designed to prevent noncompliances (recurring and other) and improve [Boeing Commercial Airplanes] compliance systems.”

FAA approved Boeing’s SMS manual in 2020 but has only audited the system once—in June 2021—6 months after Boeing implemented it. FAA found “zero unsatisfactory components or noncompliances” but identified areas for improvement, such as enhancing policy to remove contradictory language supporting a “just culture,”¹⁶ allowing risk inputs from suppliers, and strengthening communications about why safety actions have been taken. However, FAA has not performed any additional formal reviews of Boeing’s SMS despite FAA policy that it must ensure that product providers, such as Boeing, have processes and methods in place to control safety risk.¹⁷ As a result, FAA did not identify gaps in Boeing’s SMS implementation.

The settlement agreement between Boeing and FAA indicated that Boeing’s SMS would be a comprehensive and “integrated system among design, planning, production, and maintenance for the continued operational safety, certification, and airworthiness of all [Boeing Commercial Airplanes] products.” However, Boeing is excluding key data from its SMS, contrary to the requirement for an integrated system that will “apply lessons learned from regulatory noncompliances.” For example, when we questioned Boeing representatives about how findings of noncompliances within its manufacturing quality system flowed into its SMS, they stated those findings are managed within their manufacturing quality system—which does not interface with the SMS—even when there were indications the quality system may not be effectively identifying and resolving issues. An expert panel, established by FAA to fulfill requirements established in the Aircraft Certification, Safety, and Accountability Act of 2020,¹⁸ echoed this issue in a report,¹⁹ stating that Boeing “[e]mployees also expressed belief that SMS should not disturb existing product safety systems and should instead function in parallel.”

Overall, the expert panel made 15 findings and 31 recommendations related to Boeing’s safety culture and its SMS, and FAA’s ability to oversee Boeing’s SMS. According to FAA, a goal of an SMS is to move from a reactive approach that

¹⁶ According to FAA, “even unintentional errors can have a serious adverse impact on safety,” and “[t]he concept of a ‘just culture’ is one that has both an expectation of, and an appreciation for, self-disclosure of errors.”

¹⁷ FAA Order 8000.369C, *Safety Management System*, June 24, 2020.

¹⁸ Pub. L. No. 116-260, Div. V (2020) (codified at 49 U.S.C. § 44742).

¹⁹ *Section 103 Organization Designation Authorizations (ODA) for Transport Airplanes Expert Panel Review Report*, February 26, 2024.

responds to events that have already happened to a proactive and then predictive approach that analyzes processes and environments to predict future problems. However, in Boeing's case, we found that FAA has remained in the reactive phase instead of developing and implementing SMS evaluation tools to better oversee manufacturers that must soon implement an SMS. Continuing with this reactive approach will delay FAA's readiness to oversee other manufacturers and likely contributed to FAA's inaction to identify and address significant weaknesses in Boeing's SMS implementation that were identified by the panel established to review Boeing's safety management.

FAA Has Not Established Criteria To Determine If, When, and How To Return Delegated Authority to Boeing

FAA retained the authority to issue airworthiness certificates for all 737 and 787 aircraft on November 26, 2019, and February 15, 2022, respectively, so that only FAA employees could issue the certificates. FAA took these actions following the first two 737 accidents and multiple delivery delays for the 787. During this audit, we asked whether FAA had criteria for the decision to return delegated authority to Boeing. Although FAA stated that such criteria existed, FAA could not identify and provide such criteria in response to our requests that it do so. Instead, FAA referred to a Boeing approach to demonstrate stability within the manufacturing environment and eliminating undue pressure. Consequently, FAA oversight officials initiated a request to allow the Boeing ODA to begin issuing 737 and 787 airworthiness inspections again in August 2023, despite ongoing manufacturing concerns.

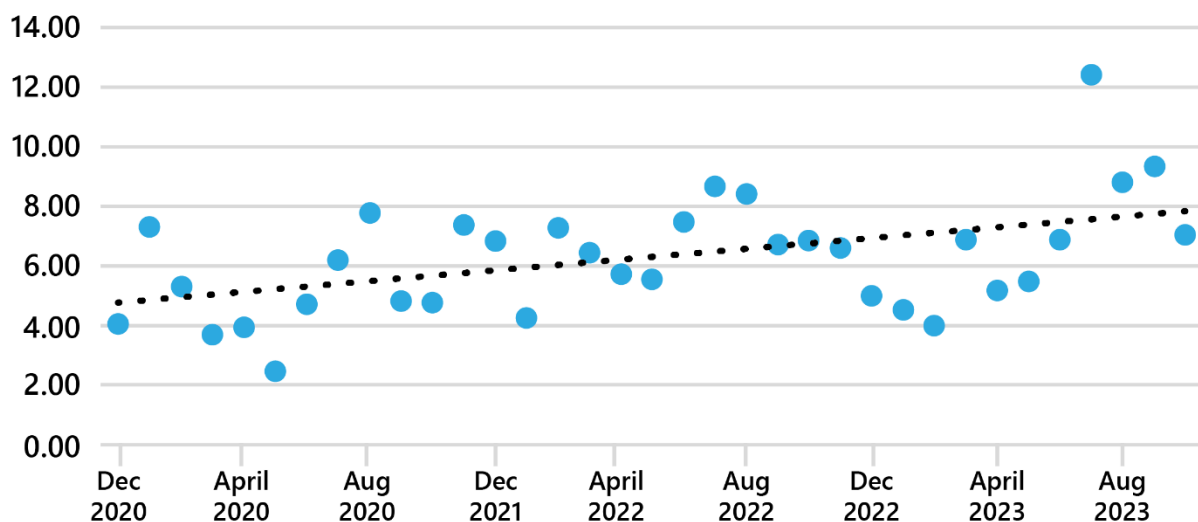
After performing more than 900 airworthiness inspections, in August 2023, FAA oversight officials initiated a request to return authority to issue airworthiness certificates to Boeing's ODA. According to the FAA official that drafted the request to return the authority to Boeing's ODA, they had seen a steady improvement in the quality of Boeing aircraft. However, as shown in figure 9 below, our regression analysis of the 737 inspection data²⁰ provided by that official shows an expected increase of 0.091 in the average number of issues per inspection each month.²¹ This represents an increase of nearly 3 issues per final

²⁰ FAA only performed three inspections on the 787 aircraft—two in July and one in August of 2023—prior to initiating the request, which is insufficient to determine whether the number of issues identified was increasing or decreasing each month for those aircraft.

²¹ A linear regression of the average number of issues identified each month proved to have a positive regression coefficient at a highly statistical significant level—an estimated 0.091 increase per month with a significance of $p < 0.01$.

inspection, on average, from December 2020 through July 2023—the month before the FAA official initiated a request to return delegated authority for final inspections.

Figure 9. Average Number of Issues Identified During FAA-Performed Final 737 Aircraft Inspections, by Month



Source: OIG analysis of FAA data

Before senior FAA officials approved the request to return ODA authority to Boeing, however, in January 2024, Alaska Airlines experienced a door plug blow out midflight. The National Transportation Safety Board’s (NTSB) preliminary report identified repairs performed at Boeing’s Renton, WA, facility to replace damaged rivets that required the opening and closing of the left door plug. The report also includes a photo showing the door plug closed, following the repairs, without retention bolts in three visible locations. This sequence of events is further evidence that quality issues persist in Boeing’s production facilities. In response to the Alaska Airlines accident, FAA required Boeing to provide a comprehensive action plan within 90 days and stated it will not allow Boeing to further expand production of 737 aircraft until quality improves to FAA’s satisfaction. This accident reinforces the need for FAA to move beyond its reactive approach and clearly define expectations before Boeing can regain authority to issue airworthiness certificates and increase production rates.

FAA Continues To Face Challenges Addressing Allegations of Undue Pressure Within Boeing Aircraft Manufacturing

FAA cannot evaluate in a timely manner Boeing's actions to address undue pressure allegations. FAA issued a Notice²² in September 2022 establishing reporting requirements for Boeing and FAA processes to evaluate those reports. However, FAA has not enforced requirements that Boeing provide information in sufficient detail on alleged undue pressure allegations. Additionally, ongoing changes to FAA's review process have further delayed FAA's ability to resolve allegations of undue pressure reported by Boeing. As a result, 15 of 34 allegations we reviewed remained unresolved by FAA for more than 1 year. Further, two of these cases have been open for more than 2 years.

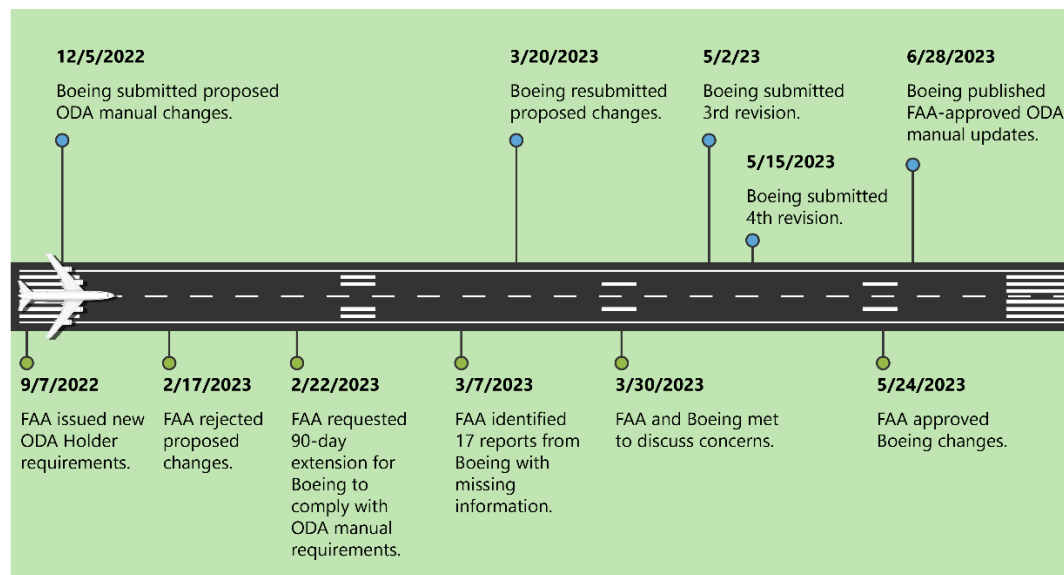
In September 2022, FAA issued a Notice to all ODA holders with provisions mandated in the 2020 Aircraft Certification, Safety, and Accountability Act for FAA "to eliminate or minimize interference by an ODA holder." The Notice outlined requirements, such as revisions to and FAA approval of ODA manuals to ensure ODA holders report allegations of interference to FAA and resolve allegations in a timely manner. The Notice also required ODA holders and FAA to address allegations of undue pressure on company employees performing inspections on FAA's behalf.

The Notice required Boeing to submit changes to its ODA Procedures Manual within 90 days and established a deadline of 180 days for FAA to approve the manual. Boeing met the initial requirement by submitting changes in December 2022. However, FAA took more than 2 months to notify Boeing that Boeing's proposed manual changes were insufficient in that the changes did not require Boeing to provide key details about the allegations that would allow FAA to determine whether Boeing adequately addressed the allegations. Then, less than 1 week later, FAA management requested an extension to the 180-day requirement to approve Boeing's manual. While FAA had multiple interactions with Boeing about the revisions needed, FAA did not enforce the requirements for Boeing to provide key details about allegations of undue pressure. As a result, Boeing did not implement requirements to track those details until after it published its FAA-approved ODA manual updates—more than 9 months after FAA established the requirements. Figure 10 below shows FAA's and Boeing's

²² FAA Notice N 8100.17, *Organization Designation Authorization (ODA) Holder Interference with ODA Unit Members (UM) and Communication between UMs and the FAA*, September 7, 2022.

actions regarding the approval and publication of Boeing’s updated ODA Procedures Manual.

Figure 10. Timeline of FAA’s and Boeing’s Actions To Approve Boeing’s Updated ODA Procedures Manual



Source: OIG analysis of FAA documentation

Since publishing its updated ODA Procedures Manual in June 2023, Boeing has been more timely in providing limited information about allegations of interference to FAA. We reviewed FAA data and found that Boeing averaged almost 6 months per case to notify FAA of alleged interference before the update. Since updating its manual, Boeing has notified FAA within 7 days. However, Boeing has continued to omit the details necessary for FAA to accept or reject Boeing’s investigative determinations. When this occurs, FAA must submit a written request to Boeing for the required information and wait for a response, which further delays its review of Boeing’s determinations.

Additionally, ongoing internal policy revisions have further hindered FAA’s ability to resolve allegations of interference in a timely manner. FAA issued an updated Notice²³ in September 2023 that added another layer of review intended to help standardize FAA acceptance or rejection of investigative determinations before FAA provides its final determinations to ODA holders, including Boeing. The Notice requires FAA inspectors to make an initial determination and send supporting documentation to an FAA Interference Review Team to make a final

²³ FAA Notice N 8100.18, *Updated Policy on Organization Designation Authorization (ODA) Holder Interference with ODA Unit Members (UM) and Communication between UMs and the FAA*, September 7, 2023.

determination. This process extends the FAA internal review timeframe from 30 days to 75 days. However, FAA has closed only 14 of the 34 allegations of undue pressure reported by Boeing. Our review of data provided by FAA shows that FAA averaged 335 days to review and close those 14 allegations. FAA has had the remaining 20 allegations under review for more than 454 days on average. As a result of the delays in obtaining information from Boeing and from FAA's internal processes, allegations of undue pressure reported by Boeing remained unresolved by FAA.

Further, FAA managers did not use the information of these cases when initiating their August 2023 request to allow Boeing's ODA to resume issuing airworthiness certificates. As stated above, FAA now issues airworthiness certificates for all 737 and 787 aircraft. While FAA identified quality and manufacturing concerns as reasons for FAA to retain that authority, FAA managers overseeing inspectors issuing certificates also stated that the final inspection is when ODA unit members are most likely to experience undue pressure because obtaining the airworthiness certificate is the last step before Boeing can deliver the aircraft.

When Boeing's ODA performed these inspections, Boeing could at any time submit a plane for inspection to an ODA unit member, which created potential concerns of undue pressure when ODA unit members did not have sufficient time to adequately perform inspections due to delivery schedules. FAA, however, established scheduling requirements to inspect Boeing aircraft. These requirements allowed FAA to better manage its inspectors' workloads and minimized the potential for undue pressure by eliminating Boeing's ability to submit planes for inspection without notice.

According to FAA managers who support returning ODA authority to Boeing, Boeing made changes to address potential pressure on ODA unit members, but FAA cannot assess the efficacy of those changes until Boeing employees begin performing final inspections again. However, these managers did not know about challenges faced by the FAA group overseeing Boeing's ODA or the investigations of ongoing undue pressure allegations. This is despite FAA's organizational realignment in March 2023. The realignment brought the various groups overseeing Boeing under the same reporting structure to provide a holistic view of Boeing and improve FAA oversight. The managers' lack of knowledge illustrates continuing weaknesses in communicating information across FAA groups overseeing Boeing, in this case between the Performance and Planning Section and the Airplane Oversight Section within FAA's new System Operation and Oversight Branch that oversees Boeing production. As a result, FAA initiated a request to return the delegated authority to Boeing's ODA without incorporating concerns from FAA's ODA oversight group, potentially allowing undue pressure on ODA unit members during this key final inspection to go undetected. Neither FAA's Notices nor its organizational realignment have ensured FAA promotes internal coordination when determining whether to

expand the authorized functions of Boeing's ODA. During our review, FAA had yet to return delegation authority to Boeing's ODA.

Conclusion

Aviation safety is FAA's primary mission, and FAA's oversight of passenger aircraft in the United States includes verifying that aviation manufacturers such as Boeing meet requirements when producing new aircraft. FAA has tried to enhance its oversight of Boeing through increased audits and organizational restructuring intended to improve collaboration among the FAA groups overseeing Boeing. However, the Agency has yet to move from a reactive approach focused on addressing individual manufacturing issues to a more proactive, data-driven model to identify and address risk within Boeing's manufacturing processes at all levels, nor has it demonstrated an ability to resolve allegations of undue pressure on Boeing employees acting on FAA's behalf. By improving its oversight model to better address risk, FAA can help to improve a failing system and restore public trust in the safety of Boeing aircraft.

Recommendations

To improve FAA oversight of Boeing aircraft production, we recommend that the Federal Aviation Administrator:

1. Develop and implement inspector guidance on how to assess risk within Boeing manufacturing facilities.
2. Develop and implement a structured oversight approach for planning and performing audits to provide a comprehensive assessment of Boeing production.
3. Assess the Aircraft Certification Audit Information System to determine whether the system incorporates the functions that the inspectors need to plan and manage effective audits. Based on the assessment results, implement changes to the system as appropriate.
4. Clarify FAA Order 8120.23A defining isolated and systemic findings and how inspectors should categorize these findings.
5. Revise guidance to require inspectors to evaluate Boeing's risk assessments of suppliers, including subtier suppliers, and incorporate the results of those assessments into FAA's audit planning.

6. Enhance inspector guidance to account for the number of Boeing suppliers, including subtier suppliers; what each supplier manufactures; and the number of audits needed to ensure Boeing effectively controls its suppliers.
7. Develop and implement procedures that require FAA to disposition recommendations from joint FAA and industry reviews related to Boeing production and manufacturing.
8. Develop and implement guidance requiring inspectors to evaluate Boeing's supplier control, including review of first article inspections, to verify suppliers can produce conforming parts.
9. Assess whether the Compliance and Enforcement Action system has the functionality that inspectors need to manage noncompliances, including the ability to track deadlines and identify potential repetitive issues. Implement changes to the system as appropriate based on the assessment results.
10. Develop and implement processes used by the Boeing oversight group to evaluate root causes of noncompliances and the associated corrective actions.
11. Train inspectors on updated guidance and system updates for the Aircraft Certification Audit Information System and the Compliance and Enforcement Action system.
12. Establish procedures to periodically evaluate Boeing's Safety Management System, including how it interfaces with Boeing's existing quality system.
13. Establish specific and measurable criteria for Boeing to meet before FAA can return delegation to Boeing's Organization Designation Authorization (ODA), including criteria from the FAA team overseeing Boeing's ODA.
14. Enforce requirements for Boeing to report allegations of undue pressure with sufficient detail, in compliance with FAA Notice N 8100.18.
15. Evaluate the impact of ongoing policy revisions and additional internal review requirements on FAA inspectors' abilities to address allegations of undue pressure in a timely manner. Develop and implement corrective actions based on the evaluation.
16. Evaluate organizational changes promoting communication across FAA groups overseeing Boeing. Develop and implement corrective actions based on the evaluation.

Agency Comments and OIG Response

We provided FAA with our draft report on August 15, 2024, and received its response on September 26, 2024, which is included as an appendix to this report. FAA concurred with all 16 of our recommendations and proposed appropriate actions and completion dates. Accordingly, we consider all recommendations as resolved but open pending completion of the planned actions.

Actions Required

We consider recommendations 1 through 16 resolved but open pending completion of the planned actions.

Exhibit A. Scope and Methodology

This performance audit was conducted between July 2022 and August 2024. We conducted this audit in accordance with generally accepted Government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Our audit objectives were to evaluate FAA's oversight of Boeing 737 and 787 production, specifically its processes for (1) identifying and resolving production issues and (2) addressing allegations of undue pressure within the production environment. We completed this audit in response to requests from the Chairmen and Ranking Members of the House Committee on Transportation and Infrastructure and its Subcommittee on Aviation and the Chair of the Senate Committee on Commerce, Science, and Transportation.

To obtain detailed information, we reviewed:

- FAA's Order on Certificate Management of PAH (Order 8120.23A) to understand FAA's process for evaluating and inspecting Boeing as a PAH;
- FAA's Order on Organization Designation Authorization Procedures (Order 8100.15B) to understand how FAA addresses undue pressure in the production environment;
- Supplementary FAA Orders 8000.17 and 8000.18 on ODA unit member communications;
- FAA's Aircraft Certification Service Compliance Program, including FAA's Order on Compliance and Enforcement Program (Order 2150.3C) and associated inspector guidance;
- International Quality Management System standards for the Aviation, Space, and Defense industry;
- Settlement agreements between Boeing and FAA;
- Multiple independent reports on Boeing's production issues, including an NTSB report and joint FAA-industry reviews from 2014 and 2024;
- FAA's CEA system for compliance and enforcement reports and Boeing's voluntary disclosures;

- Audits from the ACAIS database;²⁴
- Documentation for 737 and 787 aircraft production, including manufacturing defect data and FAI reports; and
- Correspondences between FAA and Boeing regarding aircraft production and Boeing's ODA.

We also received briefings from FAA's Oversight Division in Des Moines, WA, and North Charleston, SC. We conducted interviews of FAA managers and Aviation Safety Inspectors and spoke to FAA's Audit and Evaluation group regarding complaints of Boeing's production and undue pressure. We also interviewed and received briefings from Boeing, which included further documentation regarding Boeing's policies and procedures related to the production process and suppliers. We visited Boeing facility centers in Washington and South Carolina, where we observed the 737 and 787 final assembly lines. We received briefings and interviewed officials from Spirit AeroSystems and met with FAA's inspectors performing audits at the facility. We also interviewed public complainants regarding Boeing production issues and allegations of undue pressure. Finally, we met with the industry labor group, the Society of Professional Engineer Employees in Aerospace, regarding concerns of Boeing's production.

²⁴ We focused the review on audits completed between October 1, 2020, and September 30, 2023.

Exhibit B. Organizations Visited or Contacted

Federal Aviation Administration

Integrated Certificate Management

- Certification Program Management
- System Operation and Oversight Branch
 - Performance and Planning Section
 - Airplane Oversight Sections
 - Supplier Systems Section

Organization Designation Authorization Office

Office of the Chief Counsel

System Oversight

- Business Operations Section

Other Organizations

Boeing Commercial Airplanes

Knowles Law Firm

Spirit AeroSystems

Society of Professional Engineering Employees in Aerospace

Exhibit C. List of Acronyms

ACAIS	Aircraft Certification Audit Information System
CEA	Compliance and Enforcement Action
C.F.R.	Code of Federal Regulations
DOT	Department of Transportation
FAA	Federal Aviation Administration
FAI	First Article Inspection
NTE	Not to exceed
NTSB	National Transportation Safety Board
ODA	Organization Designation Authorization
OIG	Office of Inspector General
PAH	Production approval holder
QSA	Quality system audit
SMS	Safety Management System
U.S.C.	U.S. Code

Exhibit D. Major Contributors to This Report

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MARSHALL ANDERSON	PROJECT MANAGER
MARK PERRILL	SENIOR ANALYST
GALEN STEELE	SENIOR AUDITOR
GRACE ITA-CICCHELLI	ANALYST
JENNY LON	ANALYST
KIMBERLY BALDERSON	SUPERVISORY WRITER-EDITOR
SHAWN SALES	SUPERVISORY VISUAL COMMUNICATIONS SPECIALIST
JESSICA PADILLA	VISUAL COMMUNICATIONS SPECIALIST
GEORGE ZIPF	SUPERVISORY MATHEMATICAL STATISTICIAN
CELESTE VERCHOTA	ATTORNEY ADVISOR

Appendix. Agency Comments



Federal Aviation Administration

Memorandum

Date: September 26, 2024

To: Nelda Z. Smith, Assistant Inspector General for Aviation Audits

From: Robert C. McMillan, Director, Office of Audit and Evaluation, AAE-1

Subject: Federal Aviation Administration's (FAA) Response to Office of Inspector General (OIG) Draft Report: FAA's Oversight Processes for Identifying and Resolving Boeing Production Issues

ROBERT CALINTENO
MCMILLAN
Digitally signed by ROBERT CALINTENO MCMILLAN
Date: 2024.09.26 14:18:50 -0400

The FAA is committed to continuously improving our oversight practices to ensure each design and manufacturing organization meets all regulatory requirements and produces safe and compliant products. As a result of our unwavering commitment to aviation safety, many actions have been initiated and much work is underway to further enhance oversight practices. Following the January 5, 2024, Alaska Airlines Flight 1282 accident, the FAA took immediate action to increase our oversight of Boeing including:

- Launching a special audit of Boeing's compliance with manufacturing requirements.
- Enhancing oversight of the production of new airplanes with more FAA safety inspectors on-site at all Boeing manufacturing facilities.
- Increased auditing of quality systems, build processes, and changes outlined in Boeing's comprehensive plan.
- Provided feedback and now monitoring Boeing's data, including Key Performance Indicators to identify potential system risk.

In February, the FAA directed Boeing to develop a comprehensive action plan to address its systemic quality control and production issues. During the subsequent months, the FAA worked closely with Boeing as it developed their roadmap and plan for the path forward. Boeing provided its comprehensive plan to the FAA on May 30, 2024, marking the beginning of the next chapter of ensuring implementation and a renewed focus on safety at Boeing.

Boeing’s commitments include increasing and enhancing employee training, engagement, communication, supplier oversight, quality oversight at each step of the production process, and simplifying production processes and procedures. The FAA’s goal is to ensure Boeing implements the necessary changes and has the right tools in place to sustain those changes in the long term.

As part of our enhanced oversight of Boeing, the FAA has added more safety inspectors in the Boeing and Spirit AeroSystems facilities. Our enhanced oversight activities include:

- More engagement with company employees to hear directly from them and gauge the effectiveness of changes outlined in Boeing’s plan;
- Additional inspections at critical points of the production process; and
- Increased auditing of quality systems, build processes, and changes outlined in Boeing’s plan.

Based on our review of OIG’s draft report, the FAA concurs with the recommendations as written and plans to execute actions to fully implement the recommendations by the outlined dates below.

Recommendations	Target Implementation Dates
14	March 31, 2025
1, 7, 10, 12, 13, 15, 16	September 30, 2025
2, 4, 8	March 31, 2026
3, 5, 6, 9	September 30, 2027
11	March 31, 2028

We appreciate this opportunity to review the OIG draft report. Please contact Robert McMillan, Director of the Office of Audit and Evaluation, at Robert.C.McMillan@faa.gov if you have any questions or require additional information.

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